



“Interconnecting Grid, Desktop Grid and Network”

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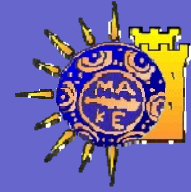
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3rd EGEE User Forum

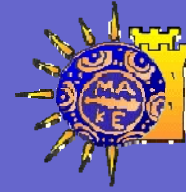
Clermont-Ferrand - 13/02/2008

Recent work of UoM



- EGEE II – Involvement in the Pre-Production service. Administration and feedback.
- HellasGrid :Organization and support of the Greek national Grid infrastructures.
- Our current work for the HellasGrid project is researching ways of incorporating national computing infrastructures to the Grid.

Current state of matters



- Grids are usually organized using a strict, hierarchical and bureaucratic model.
- Resources are dedicated and controlled by full-time administrators.
- Adding resources to the Grid is not a straight-forward (or cheap!) procedure.
- Expansion of the Grid is slow.

Possibilities →

Involve schools and academic communities

Exploit idle computing power

Utilizing desktop computers



- Add scattered computing resources to the Grid. This includes university labs, school labs, faculty pc's etc. These resources remain idle for the most part of the day.
- Inexpensive computing power. Countries can exploit and better utilize their public computing infrastructures. Public expenditure can be reduced.
- Scientific research can be advanced in a academic level with institution involvement.
- Grid technologies and research subjects are brought closer to the public and the academic community.

Possibilities for expansion



The Condor System:

- High throughput batch system that exploits the idle time of computing resources. Resources can include desktop pc's or even dedicated clusters.
- Well tested and documented. gLite supports Condor as a batch system.
- This research is mainly focused on Condor.

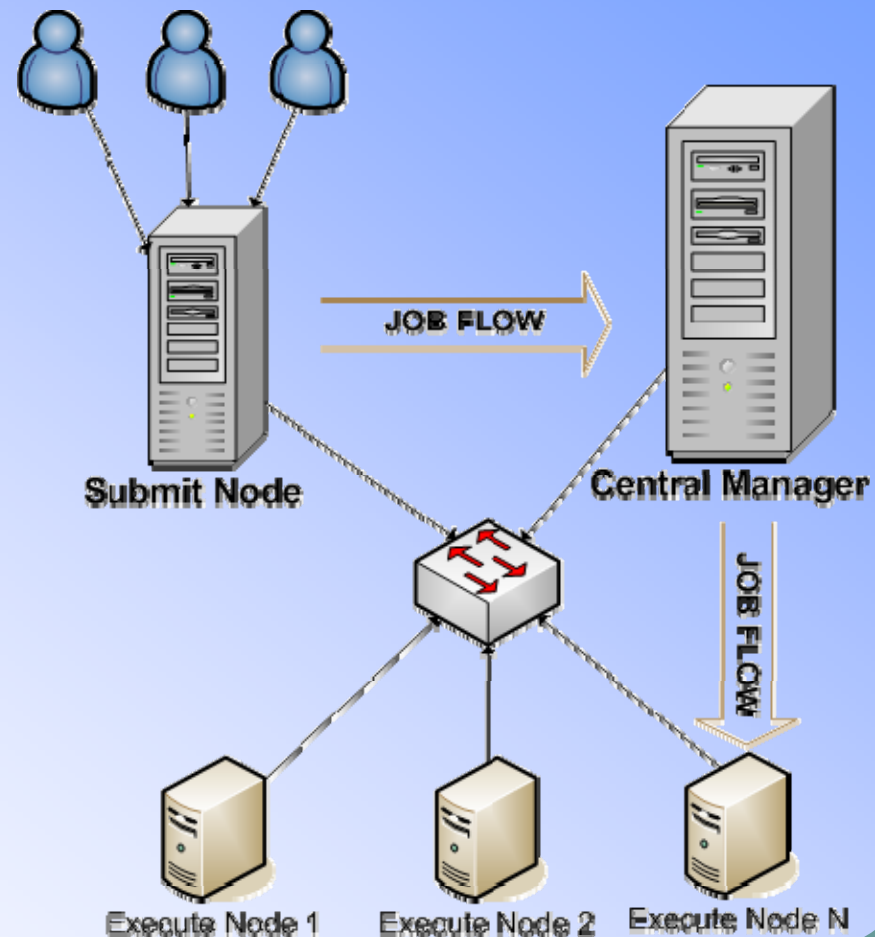
Interconnecting Grid and B.O.I.N.C:

- Public resource computing based on the SETI@Home model.
- Technical solutions for bridging Grid and B.O.I.N.C exist but are still on a experimental level.

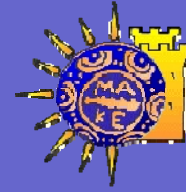
Condor & Grid – Setup



- Condor components are a **Central Manager**, a **Submit Node** and **Execute Nodes**.
- All nodes were tested with clean Debian, SL and Fedora installations and the latest stable Condor release.
- Tested to work as a standalone condor pool.

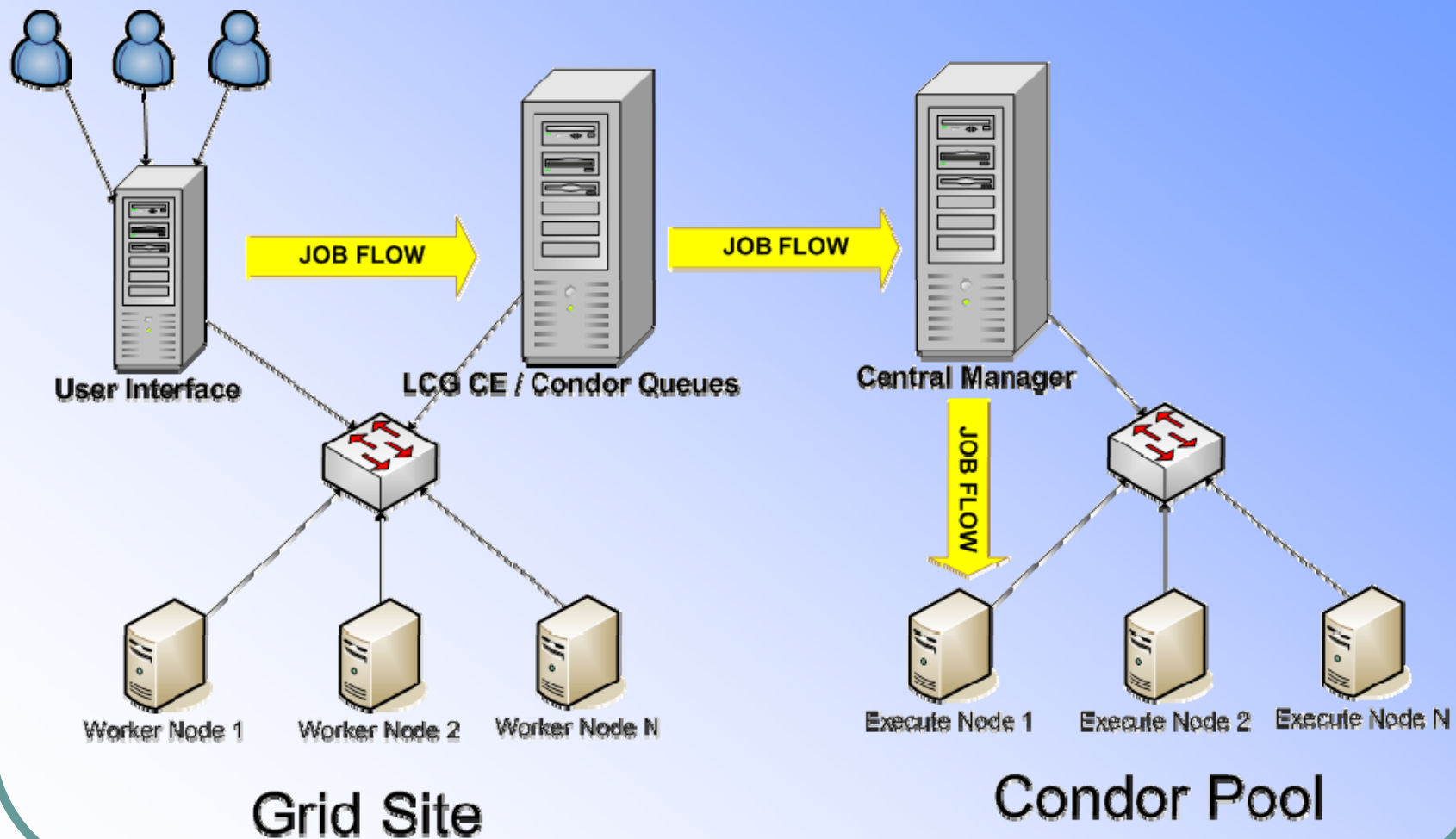
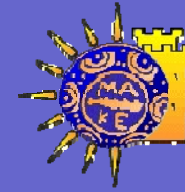


Condor & Grid – The bridge

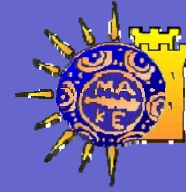


- For testing purposes we used our Pre-Production site , PreGR-01-UoM.
- Configured the LCG-CE to use Condor as a batch system. Created the appropriate queues for dteam and ops.
- The latest Condor software was installed on the LCG-CE. The system was configured as a Submit node for the Condor pool.
- Some tweaking and experimenting was necessary with some configuration files of the information system.

Condor & Grid – The bridge

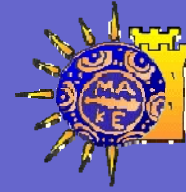


Condor & Grid – The bridge



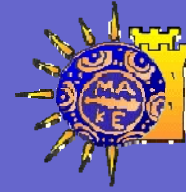
- Jobs are submitted through a UI with JDL format and are forwarded for execution on the Central Manager.
- A somehow static translation from JDL to the Condor job language occurs in the LCG-CE before the job is submitted to Condor.
- An execute node can be any machine that has the Condor software and is configured for execution. This includes the worker nodes that already exist.
- A clean system must have some grid components installed like the LCG-CA package and globus-url-copy for file retrieval from the RB.

Condor & Grid – Security



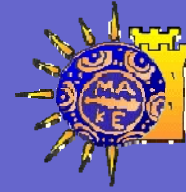
- Condor supports grid's digital certificates for authenticating users. Proxy certificates are forwarded to the Execute nodes.
- Condor can use encryption in every daemon-to-daemon communication or transfer inside the pool.
- Systems that are allowed to be Submit or Execute nodes for the Condor pool are controlled by access lists and other security mechanisms.
- In the case of Condor & Grid, submission can be allowed only from the LCG-CE providing extra security.

Condor & Grid – Security



- Traditionally Grid computing resources reside on a computer room and are controlled by administrators.
- Administrators have the responsibility of monitoring, securing and protecting their systems so that jobs run in a safe environment.
- Involving desktop pc's as a part of the Grid inherits the danger of malicious pc owners that are not controlled or monitored by anyone. Jobs and job data are at risk.

Condor & Grid – Reliability



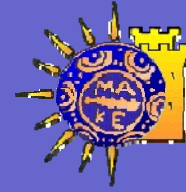
- A job running on the condor pool doesn't get lost in case of a network or system failure. After a period of time the job is rescheduled to run again on another node.
- Condor supports transparent checkpointing for jobs that are linked with the condor libraries although checkpointing doesn't seem to work for jobs submitted through Grid.
- These features were extensively tested for either standalone condor jobs or jobs that were submitted through a Grid site.

Condor & Grid – Notes



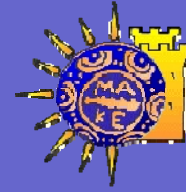
- A condor pool scales very good. A strong Central Manager can support hundreds of Execute Nodes and thousands of jobs.
- A strong Submit node is required since every job running has a corresponding “shadow” control process on the Submit node.
- Condor supports high availability of services. Backup services for Central Manager and Submit node can be easily deployed.
- Condor supports various runtime environments like “Vanilla” for standard jobs and “Standard” for jobs with checkpoint and RPC.

Condor & Grid – Benefits



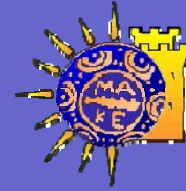
- Execute nodes can be added on the fly without any configuration change on the Central Manager (or the CE). Practically any computing resource can be added (clusters, desktop pc's etc.)
- Execute nodes can be configured to provide computing cycles only when they are not occupied by local users.
- Condor's ClassAd mechanism for resource matching is much more powerful than the fixed queues provided by a CE.
- Grid users don't have to modify their jobs in any way.

Condor & Grid – Drawbacks



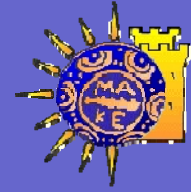
- Grid users cannot potentially use all of the power of Condor's ClassAd mechanism since the translation between Grid and Condor jobs is static.
- "Standard" universe jobs don't work through Grid. As a result checkpointing is not supported for Grid jobs.
- Condor doesn't work easily behind NAT connections. This is a drawback for incorporating school computer labs .
- Condor doesn't deal with the possibility of malicious pc owners. Some control is needed when adding resources.

Condor & Grid – Future plans



- Condor's deployment was done mainly by installing the condor software on a clean system.
- Creation of live cd with condor software installed. Make use of condor's dynamic deployment mechanism through a configuration server.
- Try to solve the NAT problem through the use of a VPN mechanism.
- Research security mechanisms so jobs can run in a safer environment. This can include digital certificates for all resources and resource ranking.

Condor & Grid – Future plans



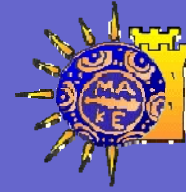
- Create a large Condor pool inside the University as a proof of concept.
- Later on: Expand the pool by including school labs from north Greece.
- Greece has over 63.000 desktop pc's in school computer labs.

Grid & B.O.I.N.C - Projects



- The Berkeley Open Infrastructure for Network Computing is an open source platform for creating scientific distributed projects modeled after the SETI@Home project.
- The Lattice project provides some GRAM components for translating Grid jobs to B.O.I.N.C jobs and forward them to a B.O.I.N.C server.
- The FatBat project has developed an untested prototype for bridging the Grid with B.O.I.N.C projects.
- The components provided by the Lattice project are tested but undocumented. Future work will involve research on installing and using these components.

End of presentation



Thank you for your attention!